The Plot-Add-Multiply Program

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I. Introduction

This program has two basic functions, symbolized by the two tabs on its front panel. The first is that it reads one or more 2-column (Y vs. X) data files and plots them on the same scale. The color, line style, point style, etc. are adjustable using the standard graph tools provided by LabVIEW.

The second function is that it computes weighted sums or products of data:

$$Y(x) = \sum w_i y_i(x) \tag{1.1}$$

or

$$Y(x) = \prod y_i(x)^{w_i} \tag{1.2}$$

with the individual data files being viewed as tabulations of functions $y_i(x)$. The files are spline-interpolated to the grid provided by the first file and pruned to the interval in x overlapped by all files.

II. Plotting

The front panel in plot mode is shown in Figure 1. When you invoke the program, the file path indicators on the left and the plot on the right are both blank. Use the browse buttons on the file paths or fill them in manually to select which files are to be included. The files will then plot on the graph. By default, the graph is not autoscaled, so use the scaling buttons on the graph to get the data to plot on scale. See the manual Common LabVIEW Conventions if you don't know about LabVIEW graph tools.

The white buttons which are shown checked (with X's) determine which files will be included in the plot. Check or un-check them to show or hide different curves. Note that the plot legend includes the filenames so that you know which curve goes with which file. Right-click on the legend to change the plotting style, color, linewidth, etc. The zoom and cursor tools can be used to explore an area and pick off data values.

There are buttons which let you save an image of the graph in `BMP` or `JPG` format or print the graph. To select the printer, select `File→Page Setup→Printer`

`setup` from the menu bar at the top of the screen. This is a LabVIEW function and so may be done from any LabVIEW program.

III. Weighted sums

Figure 2 shows the tab for sums and products. In this example, we are taking the difference between the data in the file `cr2o3.b` and that in `cr2o3.f` by adding them with weights 1 and –1 according to Equation 1). If the Mode switch had been in Π position instead of Σ, it would have been a weighted product according to Equation 2). As you can see from this example, the weights are set by the controls down the side of the plot, which correspond to the files in the path indicator.

For a weighted sum, there's no restriction on the data. However, for a weighted product, special care has to be taken for negative or zero operands. If the weights (powers) are non-integer, then it negative data would make no sense. However, if the powers are integer, then the data can be negative. Fortunately, the LabVIEW exponentiation operator does the right thing when given an integer power.

As stated above, the data are pruned and interpolated so that the domain of the result (limits of the abscissa) is the intersection of the domains of the inputs. The data are interpolated to the grid of the first file using a cubic spline algorithm with vanishing second derivatives assumed at the ends. It is sometimes useful to resample a file onto the grid of another. You can do this by setting the 'template' file as the first one, but giving it zero weight.

To save the result, push the `Save` button and a file dialog will appear.

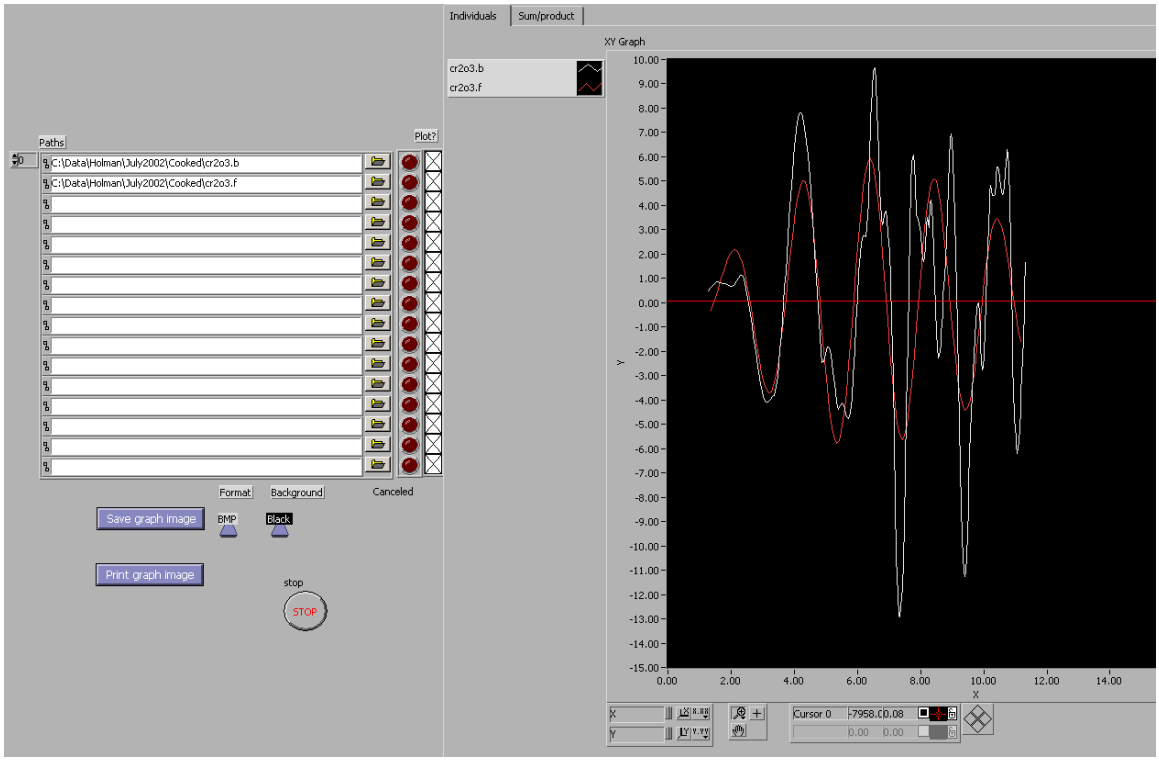

Figure 1. The plot screen with the file controls. The red line is the cursor.

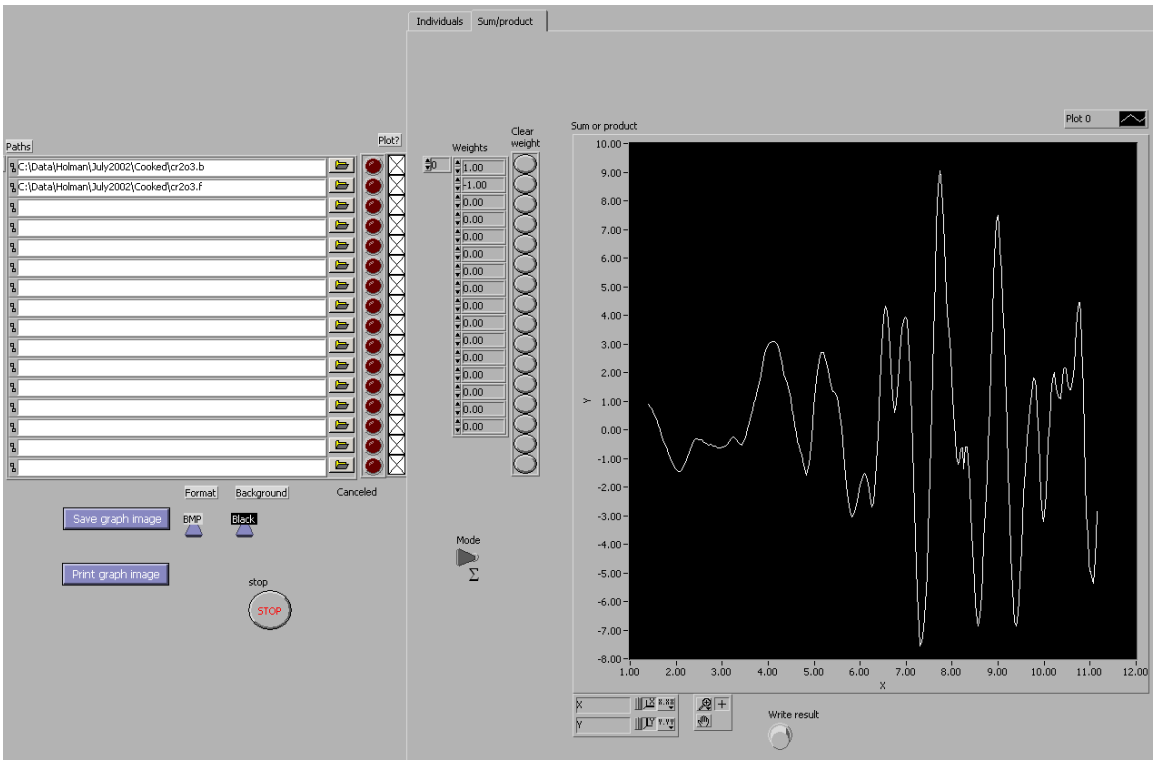

Figure 2. The sum-and-product screen, showing a weighted sum: `1*cr2o3.b+(-1)*cr2o3.f`. *It's a sum because the Mode switch is in the* Σ *position instead of* Π .